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AREA AND OWNERSHIP OF FOREST LAND IN SONOMA COUNTY, CALIFORNIA

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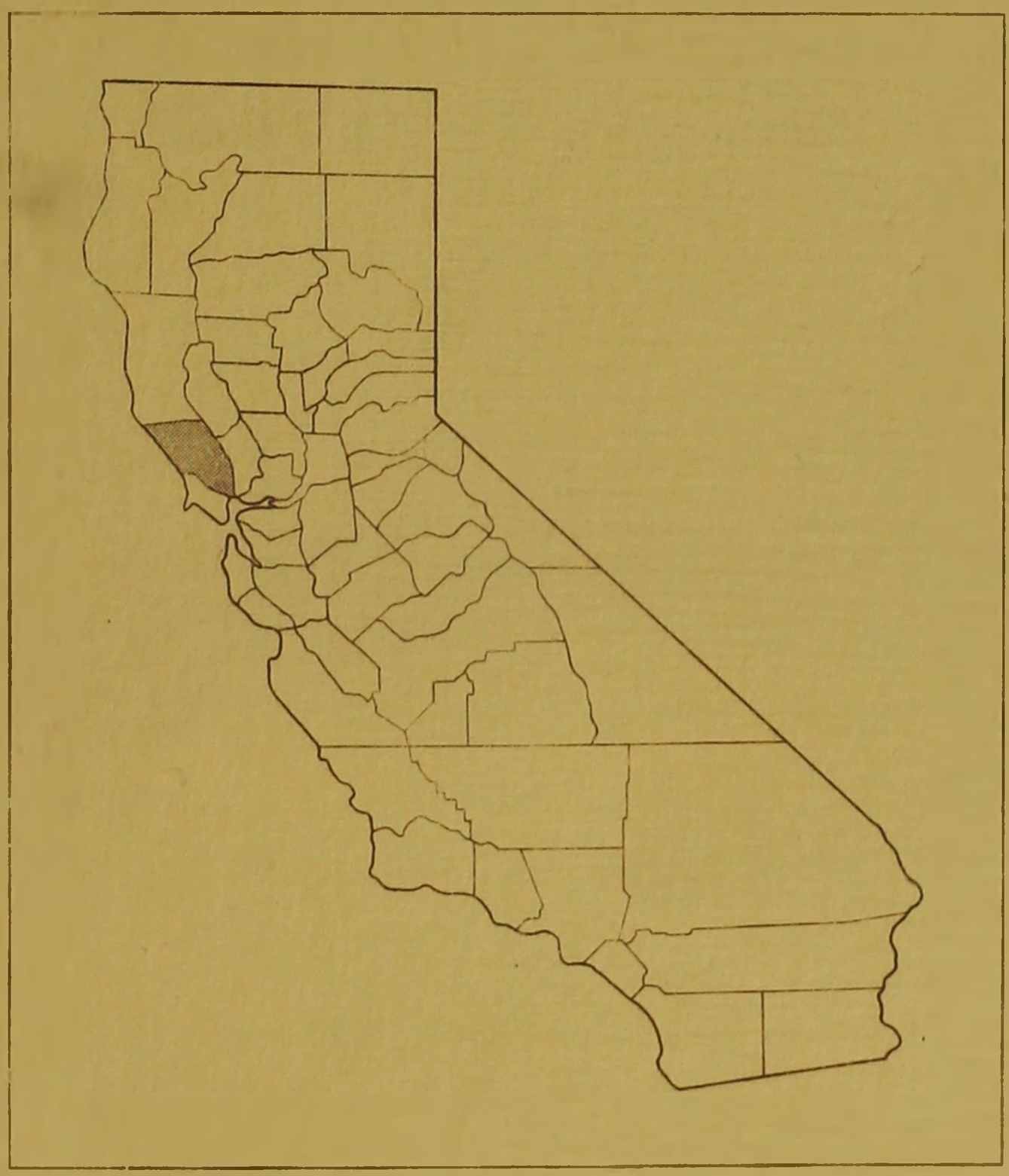

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
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CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

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The California Forest and Range Experiment Station is maintained at Berkeley in cooperation with the University of California

Agriculture--Berkeley

FOREWORD

The Forest Survey, authorized by the McSweeney-McNary Act of 1928, is a nation-wide project of the Forest Service designed to provide a comprehensive survey of the forest resource of the United States. The objective of the Survey is five-fold:

(1) To make an inventory of all forest lands and the standing timber on those lands.

(2) To measure the current and probable future rate of timber growth, and the productive capacity of the soil.

(3) To determine the rate of timber depletion through cutting, fire, insects, disease, and other causes.

(4) To determine the present and expected requirements for lumber and other forest products.

(5) To provide, through correlation of these facts with one another and with other economic knowledge, a basis for formulating local, State, and national forest policies and management plans.

Responsibility for the Survey was assigned to the research branch of the Forest Service and its regional experiment stations. In California, the Forest Survey is an activity of the Division of Forest Economics, California Forest and Range Experiment Station at Berkeley.

This release presents the statistics of forest areas and forest land ownership in Sonoma County as of 1948. Besides the statistics on the extent, location, and condition of all forest lands and timber stands on those lands, this report presents quantitative data on type and size of ownership and number and kinds of owners. Estimates of timber volume are not included because volume sampling was not designed to provide volumes at the county level.

Other county statistical reports presenting data on area and ownership of forest land have been published for Siskiyou, Trinity, Mendocino, and Lake counties. Also, a major statistical report has been published for the Coast Range Pine subregion which presents data on areas, timber volumes, ownership, growth, and drain.

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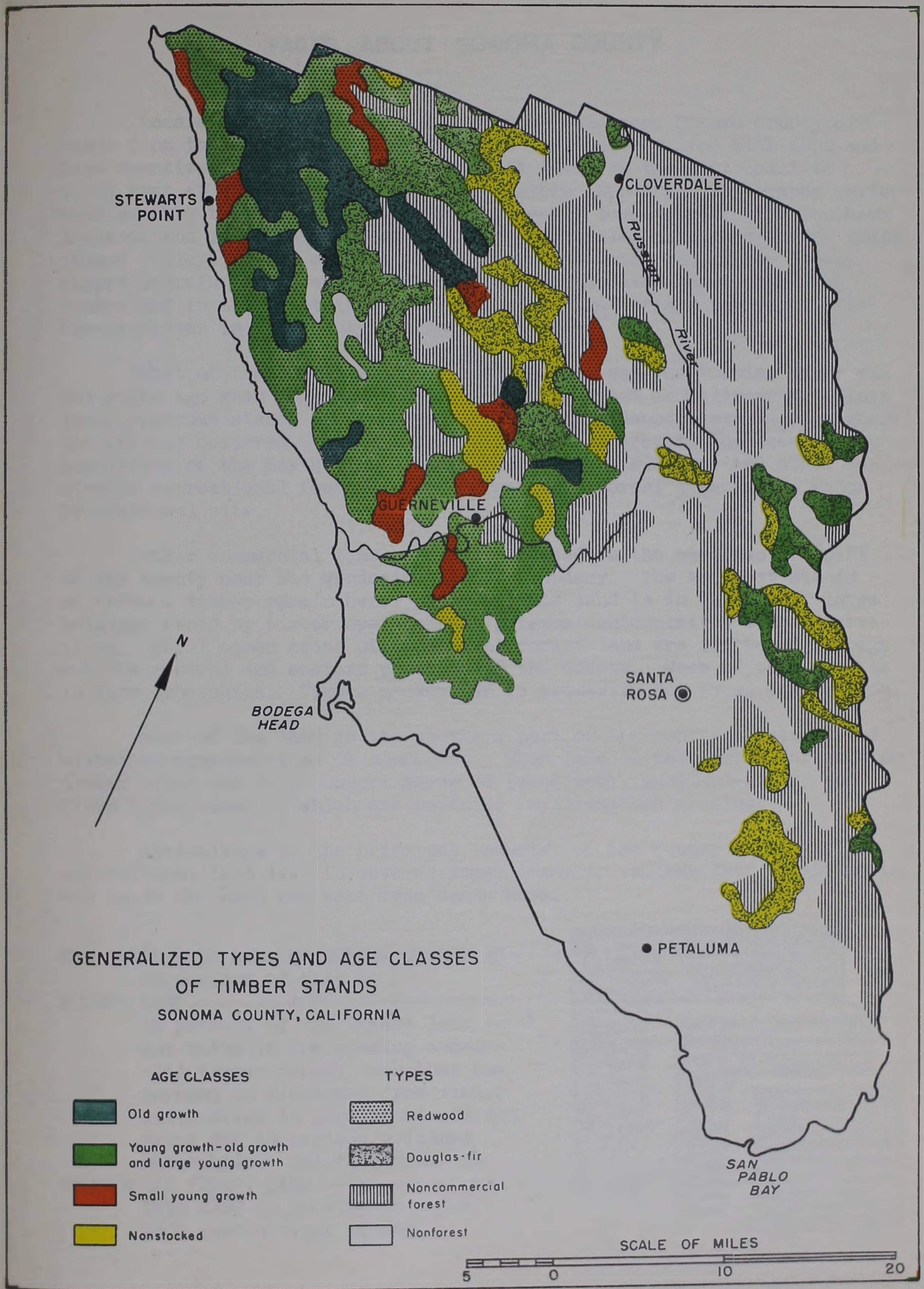

STEWARTS POINT
CLOVERDALE
Russian River
GUERNEVILLE
SANTA ROSA
BODEGA HEAD
PETALUMA
SAN PABLO BAY
N
GENERALIZED TYPES AND AGE CLASSES OF TIMBER STANDS
SONOMA COUNTY, CALIFORNIA
AGE CLASSES
Old growth
Young growth - old growth and large young growth
Small young growth
Nonstocked
TYPES
Redwood
Douglas-fir
Noncommercial forest
Nonforest
SCALE OF MILES
5
0
10
20

FACTS ABOUT SONOMA COUNTY

Located about 40 miles north of San Francisco, Sonoma County extends from the Pacific Coast eastward to the boundary line with Napa and Lake Counties. Elevations range from sea level on the west coast to 4,262 feet at Mt. St. Helena near the eastern boundary. Topography varies considerably throughout the county with nearly level land in the southern lowlands and large interior valleys; rolling hills interspersed with small inland valleys in the central and northern portions; and rather steep, rugged terrain in the wooded areas of the northwestern portion of the county and in the mountainous sections along the eastern boundary. The Russian River is the county's principal stream.

Most of the old-growth timber along and near the Russian River was cut years ago when logging of redwood first started in California. Since then, vigorous stands of young growth, largely redwood, have regrown where the cutting occurred. But the proximity of this area to the heavy urban population of the Bay Region, its pleasant summer climate, and other desirable recreational features have turned this forest area into a major recreational site.

Other commercial timber land is located in the northwestern part of the county near the Mendocino County boundary. The heaviest stands of redwood timber remain here. Much of this land is in relatively large holdings owned by timber operators or persons contemplating timber operations. Still other areas of commercial forest land are scattered throughout the central and eastern portions of the county. Much of this land is in farm ownerships. Timber production is primarily for local consumption.

Most of the land in the southern part of the county is classified either as noncommercial or nonforest. This land is unsuitable for growing timber crops but does support hardwood (woodland), woodland-grass, and grass types--most of which are suitable for livestock grazing.

Agriculture is the principal industry of the county. The best agricultural land lies in several large interior valleys that extend north and south and east and west from Santa Rosa.

THE TOTAL LAND AREA OF SONOMA COUNTY IS 1,011,000 acres

55 percent of this is

FOREST LAND 553,000 acres

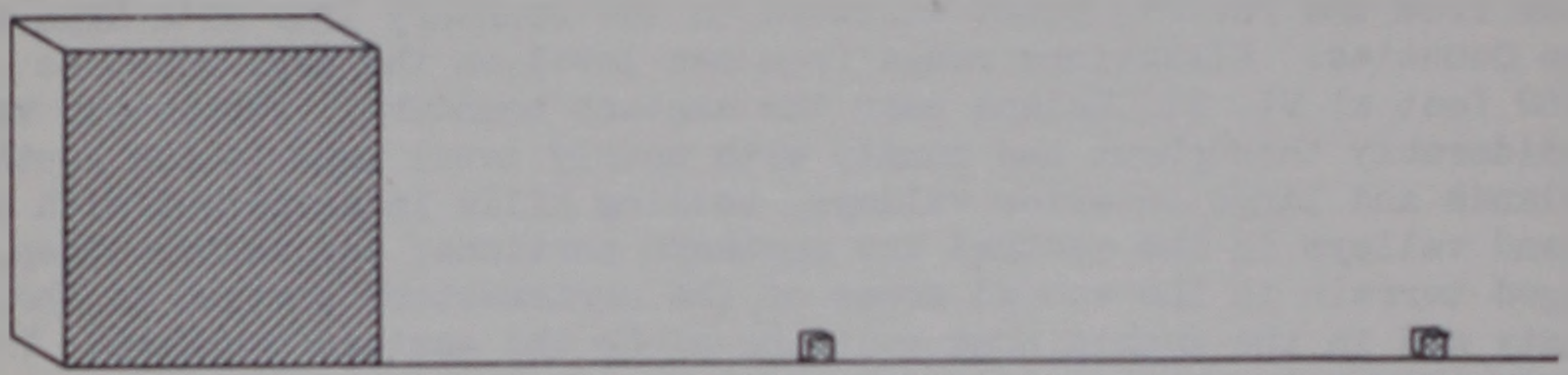
46 percent of the forest land is not suitable for growing commercial timber crops; less than one percent is withdrawn from timber utilization to provide recreation areas and to protect critical watersheds. But 54 percent is

COMMERCIAL FOREST LAND 296,000 acres

This land is growing or could grow usable crops of wood.

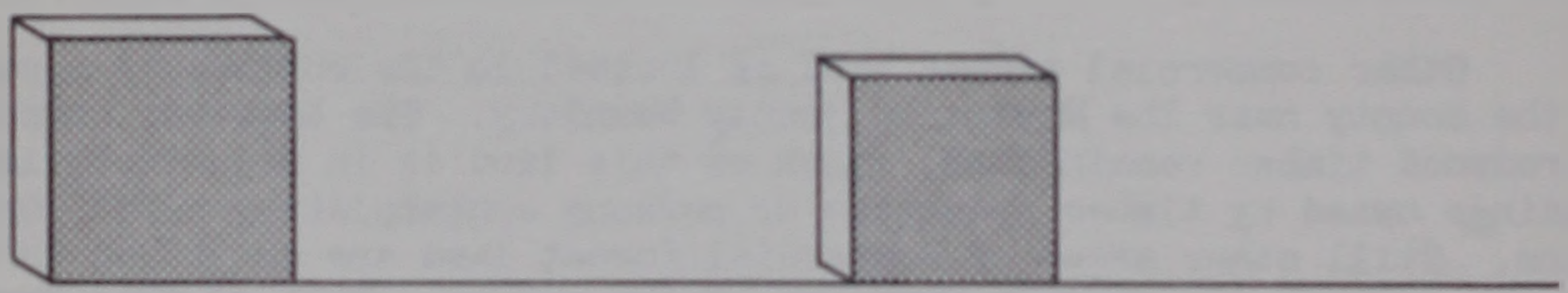
COMMERCIAL FOREST LAND

OWNERSHIP



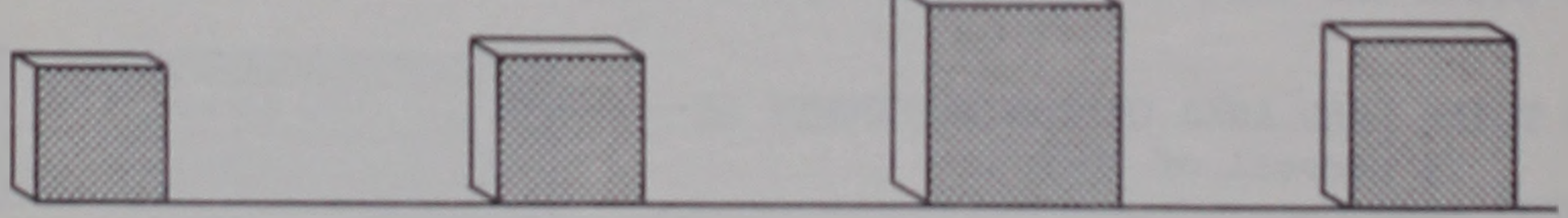
98 percent of the commercial forest land is privately owned. The remainder is divided equally between Federal and State, County, and Municipal ownerships. (table 1)

TYPES



All the commercial forest land has been classified into two forest types. About three-fifths is occupied by redwood stands. Douglas-fir stands cover the remaining area. (table 5)

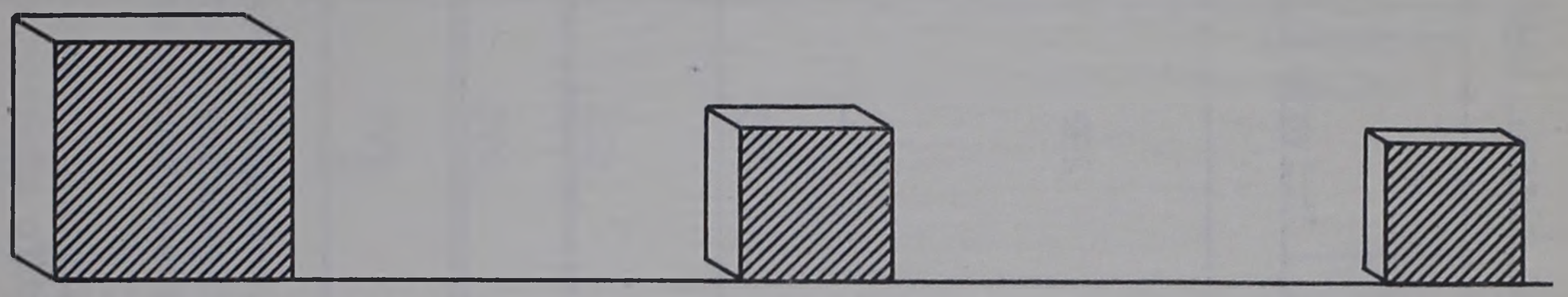
AGE CLASSES



Young-growth stands occupy 37 percent of the commercial forest land. 25 percent is nonstocked with commercial conifers. An additional 21 percent of the commercial forest land is covered by young growth-old growth stands. Old-growth timber stands, which include most of the county's merchantable timber, occupy the remaining 17 percent of the area. (table 7)

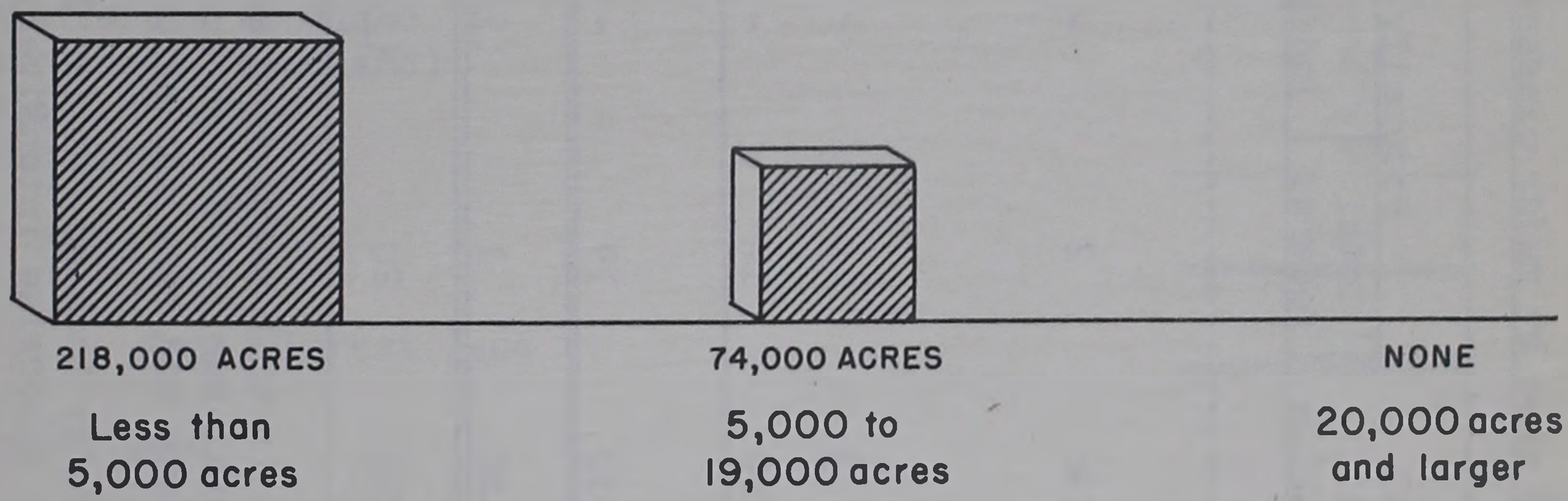
PRIVATELY OWNED
COMMERCIAL FOREST LAND

TYPE OF OWNERSHIP



Farmers own 57 percent of the commercial forest land. Owners of recreational, residential and other similar properties have 23 percent; and the remaining 20 percent belongs to corporations and individuals engaged in commercial logging and milling of timber or planning future operations. (table 3)

SIZE OF OWNERSHIP



Three-fourths of the privately owned timber land is in ownership units of less than 5,000 acres. The remainder is in holdings ranging from 5,000 to 19,000 acres. There are no ownership holdings of 20,000 acres or larger. (table 6)

Table 1.- Total land area by major classes of land and by ownership class, 1948

Class of land	Total all ownerships	Federally owned 1/			State, county, and municipal	Private	Unclassified 3/
		Total federal	Indian	Other 2/			
	Thousand acres						
Forest land							
Commercial forest land	296	2	-	2	2	292	-
Noncommercial forest land							
Area reserved from commercial timber use	1	-	-	-	1	-	-
Area of low productivity for timber	256	17	-	17	3	233	3
Total forest land	553	19	-	19	6	525	3
Nonforest land	4/ 458	1	(5/)	1	3	270	184
All land	6/ 1,011	20	(5/)	20	9	795	187

1/ Because all figures in this tabulation are derived by sampling procedure, total acreage figures vary somewhat from actual published land acreages of various public agencies listed here. For details on sampling procedure and sampling errors for various area sizes see Appendix.

2/ Chiefly public domain.

3/ A portion of the county located outside the broad limits of commercial forest land and classified as agricultural and otherwise intensively developed land. Ownership aspects of this area were not considered essential to this study.

4/ Includes 2,000 acres of water according to survey standards of area classification but defined by the Bureau of Census as land.

5/ Less than 500 acres.

6/ From "Areas of the United States 1940," U. S. Bureau of the Census.

Table 2.- Total land area by vegetation and nonvegetation types, 1948

Type	Area Thousand acres
Commercial forest land	
Redwood	180
Douglas-fir	116
Total	296
Noncommercial forest land	
Area reserved from commercial timber use	
Douglas-fir	1
Area of low productivity for timber	
Coniferous woodland	11
Hardwoods (woodland)	66
Woodland-grass	121
Chaparral	58
Total	257
Total forest land	553
Nonforest land	
Grass	208
Coastal sagebrush	4
Barren	6
Marsh	11
Cultivated, urban and industrial	227
Water 1/	2
Total nonforest land	458
All land	1,011

1/ Water according to survey standards of area classification but defined by the Bureau of Census as land.

Table 3.- Number of ownerships and area of privately owned land by type of ownership, 1948

Type of ownership	Ownerships		Total land area		Commercial forest land	Non-commercial forest land	Non-forest land
	No.	Pct.	Thousand acres	Pct.	--- Thousand acres ---		
Timber operating company	2	0.1	5	0.6	5	-	(1/)
Timber holding company	1	0.1	12	1.5	12	(1/)	(1/)
Timber operating individual	36	1.2	33	4.2	30	2	1
Timber holding individual	31	1.0	16	2.0	11	4	1
Range livestock farming company	3	0.1	15	1.9	6	6	3
Range livestock farming individual	252	8.3	316	39.7	125	110	81
Other farmers	1,326	43.8	186	23.4	35	56	95
Recreational property owners	597	19.7	59	7.4	28	25	6
Other classified owners 2/	778	25.7	81	10.2	36	26	19
Unclassified 3/	-	-	72	9.1	4	4	64
All types	3,026	100.0	795	100.0	292	233	270

1/ Less than 500 acres.

2/ All other land owners whose classification is known but does not logically fit the classes listed above. Examples are owners of land held for residential purposes only, mining claims, and reservoir sites.

3/ Small urban, suburban, and industrial ownerships that are too small to map and classify properly; nonforest farm ownerships within strictly agricultural communities; and ownerships that for other reasons cannot be classified and placed in appropriate categories.

Table 4.- Number of ownerships and area of privately owned land by size of ownership, 1948

Size of ownership	Ownerships		Total land area		Commercial forest land	Non-commercial forest land	Non-forest land
Acres	No.	Pct.	Thousand acres	Pct.	----- Thousand acres -----		
1- 179	2,433	80.4	131	18.1	45	36	50
180- 379	282	9.3	85	11.7	27	24	34
380- 699	137	4.5	94	13.0	28	41	25
700- 1,299	79	2.6	83	11.5	29	24	30
1,300- 2,599	59	2.0	117	16.2	43	40	34
2,600- 4,999	23	0.8	88	12.2	42	31	15
5,000- 9,999	7	0.2	49	6.8	25	13	11
10,000-19,999	6	0.2	76	10.5	49	20	7
20,000-29,999	-	-	-	-	-	-	-
All classified ownerships	3,026	100.0	723	100.0	288	229	206
Unclassified	-	-	72	-	4	4	64
Total acreage	-	-	795	-	292	233	270

Table 5.- Commercial forest land by type of ownership and by timber type, 1948

Type of ownership	Total		Timber type	
			Redwood	Douglas-fir
	Thousand acres	Pct.	------ Thousand acres---	
Public Domain	2	0.7	-	2
Other Federal	(1/)	-	(1/)	-
State, county and municipal	2	0.7	1	1
Timber operating company	5	1.7	5	-
Timber holding company	12	4.1	12	-
Timber operating individual	30	10.1	26	4
Timber holding individual	11	3.7	8	3
Range livestock farming company	6	2.0	5	1
Range livestock farming individual	125	42.2	71	54
Other farmers	35	11.8	18	17
Recreational property owners	28	9.4	10	18
Other classified owners	36	12.2	20	16
Unclassified	4	1.4	4	(1/)
All types	296	100.0	180	116

1/ Less than 500 acres.

Table 6.- Privately owned commercial forest land by size of ownership and by timber type, 1948

Size of ownership	Total		Timber type	
			Redwood	Douglas-fir
Acres	Thousand acres	Pct.	--- Thousand acres ---	
1- 179	45	15.6	26	19
180- 379	27	9.4	14	13
380- 699	28	9.7	14	14
700- 1,299	29	10.1	19	10
1,300- 2,599	43	14.9	24	19
2,600- 4,999	42	14.6	29	13
5,000- 9,999	25	8.7	16	9
10,000-19,999	49	17.0	34	15
20,000-29,999	-	-	-	-
All classified ownerships	288	100.0	176	112
Unclassified	4	-	3	1
Total acreage	292	-	179	113

Table 7.- Commercial forest land by type of ownership and by age class of timber, 1948

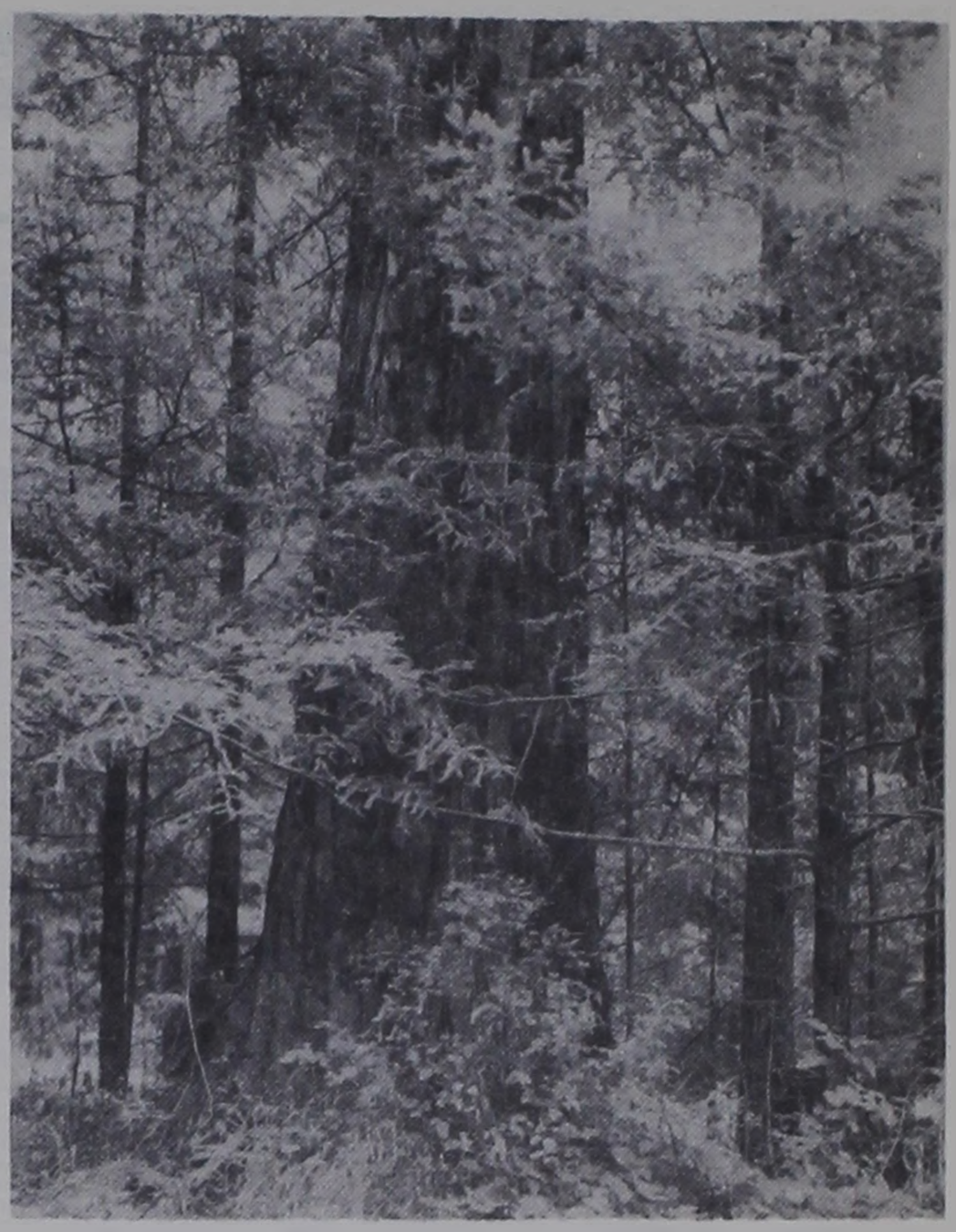
Type of ownership	Total		Age class					
			Old growth	Old growth-young growth	Young growth-old growth	Large young growth	Small young growth	Non-stocked 1/
	Thousand acres	Pct.	Thousand acres					
Public Domain	2	0.7	-	1	(2/)	(2/)	-	1
Other Federal	(2/)	-	-	-	-	(2/)	-	-
State, county, and municipal	2	0.7	-	-	1	1	-	(2/)
Timber operating company	5	1.7	-	1	1	2	-	1
Timber holding company	12	4.1	(2/)	4	2	6	(2/)	(2/)
Timber operating individual	30	10.1	1	16	7	3	-	3
Timber holding individual	11	3.7	-	3	3	3	(2/)	2
Range livestock farming company	6	2.0	-	(2/)	3	2	(2/)	1
Range livestock farming individual	125	42.2	1	17	30	49	2	26
Other farmers	35	11.8	-	1	3	15	1	15
Recreational property owners	28	9.4	-	3	6	8	2	9
Other classified owners	36	12.2	-	2	6	11	2	15
Unclassified	4	1.4	-	-	1	2	-	1
All types	296	100.0	2	48	63	102	7	74

1/ Commercial forest land nonstocked with commercial conifers but covered primarily with hardwoods, chaparral and grass.

2/ Less than 500 acres.

AGE CLASSES OF TIMBER STANDS ON COMMERCIAL FOREST LAND

Old growth



Young growth - old growth

Large young growth

Small young growth

Table 8.- Privately owned commercial forest land by size of ownership and by age class of timber, 1948

Size of ownership	Total		Age class					
			Old growth	Old growth-young growth	Young growth-old growth	Large young growth	Small young growth	Non-stocked
Acres	Thousand acres	Pct.	---------- Thousand acres ----------					
1- 179	45	15.6	-	3	9	18	2	13
180- 379	27	9.4	(1/)	2	4	10	1	10
380- 699	28	9.7	-	3	6	8	(1/)	11
700- 1,299	29	10.1	-	3	8	8	1	9
1,300- 2,599	43	14.9	1	7	8	15	1	11
2,600- 4,999	42	14.6	-	4	12	15	2	9
5,000- 9,999	25	8.7	(1/)	4	4	11	(1/)	6
10,000-19,999	49	17.0	1	21	10	14	(1/)	3
20,000-29,999	-	-	-	-	-	-	-	-
All classified ownerships	288	100.0	2	47	61	99	7	72
Unclassified	4	-	-	-	1	2	-	1
Total acreage	292	-	2	47	62	101	7	73

1/ Less than 500 acres.

Table 9.- Commercial forest land by age class of timber and by density of stand, 1948

Age class	Total	Density of stand			
		Dense and semidense	Open	Very open	Non-stocked
	---------- Thousand acres ----------				
Old growth	2	1	-	1	-
Old growth-young growth	48	35	10	3	-
Young growth-old growth	63	29	22	12	-
Large young growth	102	43	36	23	-
Small young growth	7	(1/)	(1/)	7	-
Nonstocked	74	-	-	-	74
Total	296	108	68	46	74

1/ Less than 500 acres.

Table 10.- Commercial forest land by timber type and by site quality, 1948

Timber type	Total	Site quality		
		High	Medium	Low
	---------- Thousand acres ----------			
Redwood	180	122	51	7
Douglas-fir	116	-	78	38
All types	296	122	129	45

Table 11.- Commercial forest land area by timber type, stand-size class, degree of stocking, and ownership, 1948

Timber type and stand-size class[1]	All areas			Degree of stocking[2] and ownership											
				Well-stocked			Medium-stocked			Poorly stocked			Nonstocked		
	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private
	Thousand acres														
Redwood															
Old-growth saw timber	38	-	38	30	-	30	6	-	6	2	-	2	-	-	-
Young-growth saw timber	113	1	112	54	1	53	38	(3/)	38	21	-	21	-	-	-
Pole timber	5	-	5	(3/)	-	(3/)	(3/)	-	(3/)	5	-	5	-	-	-
Nonstocked	24	-	24	-	-	-	-	-	-	-	-	-	24	-	24
Total	180	1	179	84	1	83	44	(3/)	44	28	-	28	24	-	24
Douglas-fir															
Old-growth saw timber	12	1	11	6	-	6	4	1	3	2	-	2	-	-	-
Young-growth saw timber	52	1	51	18	1	17	20	(3/)	20	14	(3/)	14	-	-	-
Pole timber	2	-	2	(3/)	-	(3/)	(3/)	-	(3/)	2	-	2	-	-	-
Nonstocked	50	1	49	-	-	-	-	-	-	-	-	-	50	1	49
Total	116	3	113	24	1	23	24	1	23	18	-	18	50	1	49
All types															
Old-growth saw timber	50	1	49	36	-	36	10	1	9	4	-	4	-	-	-
Young-growth saw timber	165	2	163	72	2	70	58	(3/)	58	35	(3/)	35	-	-	-
Pole timber	7	-	7	(3/)	-	(3/)	(3/)	-	(3/)	7	-	7	-	-	-
Nonstocked	74	1	73	-	-	-	-	-	-	-	-	-	74	1	73
Total	296	4	292	108	2	106	68	1	67	46	(3/)	46	74	1	73

1/ See relationship of stand-size classes to age classes, page 21.
2/ To obtain degree of stocking, Survey density classes were converted as follows: dense and semi-dense -- well stocked; open -- medium stocked; and very open -- poorly stocked.
3/ Less than 500 acres.

PROCEDURES

Area Delineation

To determine the extent, location and condition of all forest lands in Sonoma County, aerial photographs were delineated on the basis of (1) present vegetation cover, (2) suitability for growing timber crops, and (3) age and density of timber stands. The minimum unit classified and mapped was ten acres.

The segregation of timber growing lands from other lands was a matter of some difficulty where commercial conifers were missing from the area. It has been assumed, on the basis of their location, that such areas once supported timber stands and will do so again if reforested. While this assumption may be true in most cases, as verified by observation and historical evidence, soil surveys now in progress on timbered areas elsewhere have demonstrated that some nonstocked areas have soils too shallow to support timber growth. Since this may be the case in Sonoma County, the status of some of the nonstocked areas classified in this release as commercial and reserved commercial forest land must remain doubtful until soil surveys provide a basis for final decision.

Transfer to base maps

After photo delineation was completed, Timber Stand Maps were prepared by transferring photo classifications to 7-1/2-minute quadrangle size base maps at a common scale of 2 inches to the mile. As a final preparation for area measurement other related information such as political and economic subdivisions, ownership, and commercial timber type boundaries were marked along east-west transect lines spaced 2 miles apart. Inasmuch as there were changes in the timber classifications caused by cutting and fire since the date of aerial photography, boundary adjustments were made along these transect lines so that the class acreages when compiled would show conditions as of the inventory year.

Ownership determinations

Data pertaining to land ownership were obtained from the Sonoma County tax assessment rolls, and from other official records of the Sonoma County Assessor and the Tax Collector. These records were used in selecting the ownership sample and in classifying the private ownership holdings into appropriate size classes. Qualitative data used in classifying the holdings selected by types of ownership were obtained from maps, reports and other information provided by various public agencies owning land in the county, from questionnaire cards mailed by the State Division of Forestry to all private land owners included in the sample, and from interviews in the field with local officials, farmers, and residents.

Area measurement and compilation

Acreage figures were obtained by recording line intercept measurements of all pertinent class subdivisions along each of the sample lines transecting the quadrangles.1/ The ratio of total line length to total area for the quadrangle provided the factor to convert line segments in inches to area in acres. These acreages were then totaled, and adjusted if necessary, to check with the Census acreage for the county. Area estimates of ownership were obtained by the same procedure, the ownership intercepts being obtained by reference to county status maps and records. Estimated acreage figures appearing in the tables were compiled and summarized by means of punch cards and card tabulating equipment.

Site quality determination

Three broad site classes:2/ high, medium, and low, have been used to express the relative capacity of commercial forest land to produce timber crops. Sixty-eight (68) separate field site determinations, well distributed over the two major timber types, were grouped into these three classes. For each type the number of site determinations in each class was expressed as a percent of all observations within the type. These percentages were then applied to the total area by type to provide estimates of relative site quality.

ACCURACY OF ESTIMATE

Estimates of acreages in the various land classes as determined by the Forest Survey procedures are subject to two general types of errors: (1) non-sampling errors in photo classification, mapping, tabulation, computation and compilation, and (2) sampling errors which arise from taking a sample rather than making a complete inventory. Errors of the first type are kept to a minimum by frequent checking and close supervision of all phases of the field and office work. Sampling errors are measures of the reliability of the acreage estimates and can be computed by statistical methods. The magnitude of the sampling error depends upon the intensity of the sample and the variability of the data.

Analyses of the line transect measurements of area for Sonoma County show the following sampling errors3/ for the principal forest land classes:

1/ Details of the line sampling method used for estimating area and procedure for estimating number of owners are given in "A New Approach to Forest Ownership Surveys," by A. A. Hasel and Adon Poli, Land Economics, Vol. XXV, No. 1, Feb. 1949, pp. 1-10.

2/ For components of these broad classes see page 20.

3/ For one standard error; that is, the chances are two out of three that the calculated acreages would not differ from the class acreages which would be obtained by 100-percent measurement by more than the errors shown in the table.

Class	Sampling error	
	Acres	Percent
Forest land	15,484	2.8
Commercial forest land	11,248	3.8
Noncommercial forest land	10,537	4.1

Statistics of forest area by age class, type and ownership classes presented in this report are subject to increasing sampling error as the class acreage decreases. A partial range of area sampling errors is shown below.

Area in class	Standard error in percent
10,000	± 21.0
20,000	± 14.5
40,000	± 10.5
100,000	± 6.5
200,000	± 4.5
500,000	± 3.0
1,000,000	± 2.0
2,000,000	± 1.5

DEFINITION OF TERMS

Area

Total forest land area. Includes (a) lands which are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which have not been developed for other use; (c) afforested areas; and (d) chaparral areas.

Commercial forest land. Forest land which (a) is producing, or physically capable of producing usable crops of wood (usually saw timber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest land. Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land and (b) incapable of yielding usable wood products (usually saw timber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Chaparral land. Lands supporting heavily branched dwarf trees or shrubs, usually evergreen, the crown canopy of which normally covers more than 50 percent of the ground and whose primary value is watershed protection. The more common chaparral constituents are species of Quercus, Cercocarpus, Carrya, Ceanothus, Arctostaphylos, and Adenostoma.

Reserved commercial forest land. Forest land withdrawn from timber utilization through statute, ordinance, or administrative order that otherwise qualifies as commercial forest land.

Nonforest land area. Land that does not qualify as forest land. Includes land which has never supported forest growth; land from which the forest has been removed to less than 10 percent stocking and has been developed for other use; all land in thickly populated urban and suburban areas; and water classified by the Bureau of Census as land.

Timber Stand Classifications

Age classes of commercial conifer stands4/ on commercial and reserved commercial forest land:

4/ Stands composed of the following species, singly or in combination: redwood, Douglas-fir, sugar pine, ponderosa pine, white fir, grand fir, and western hemlock.

1. Old growth: Mature trees[5/] compose more than 80 percent of the conifer canopy.

2. Old growth-young growth. Mature trees compose from 50 to 80 percent of the conifer canopy.

3. Young growth-old growth. Mature trees compose 20 to 50 percent of the conifer canopy.

4. Young growth. Mature trees compose less than 20 percent of the conifer canopy.

   a. Large young growth. More than 5 percent of the immature trees are larger than 11 inches d.b.h.

   b. Small young growth. Ninety-five percent or more of the immature trees are less than 11 inches d.b.h.

Density classes of commercial conifer stands on commercial forest land:

1. Dense and semidense. Commercial conifers cover 50 percent or more of the ground space.

2. Open. Commercial conifers cover from 20 to 50 percent of the ground space.

3. Very open. Commercial conifers cover from 5 to 20 percent of the ground space.

4. Nonstocked. Commercial conifers cover less than 5 percent of the ground space.

Timber type. An extensive area of commercial or reserved commercial forest land characterized by a predominant conifer species or group of conifer species. Other vegetation (such as hardwood and chaparral areas) and/or nonvegetation types (such as barren areas) may also occur in subordinate amounts within the same area.

Commercial timber types:

a. Douglas-fir: areas with Douglas-fir comprising more than 80 percent of the timber cover; or mixtures of Douglas-fir and the true firs in which Douglas-fir comprises 20 percent or more of the timber cover.

b. Redwood: areas with redwood comprising 20 percent or more of the timber cover.

5/ All trees that can be considered as having passed their optimum growth.

Other timber and vegetation types:

a. Coniferous woodland: areas with such trees as knobcone pine, digger pine, juniper, western yew, California nutmeg, and scattered and scrub trees of commercial conifer species, covering more than 5 percent of the ground space and predominant over hardwoods that may partly compose the cover.

b. Hardwoods: areas with hardwood trees (oaks, madrone, etc.), covering more than 50 percent of the ground except where in mixture with commercial conifers or herbaceous vegetation.

c. Woodland-chaparral: areas with hardwood trees and chaparral occurring in mixture - without commercial conifers - and the trees covering from 5 to 80 percent of the ground area and together with chaparral predominant over other vegetation elements present in the cover.

d. Woodland-grass: areas with hardwood trees and herbaceous vegetation occurring in mixture - without commercial conifers - and the trees covering from 5 to 80 percent of the ground area and predominant over minor conifers present in the cover.

e. Shrub and herb types consist of the following, where not in mixtures with minor conifers or hardwoods:

1. Chaparral: areas with such shrubs as manzanita, ceanothus, scrub oaks, etc., covering more than 50 percent of the ground.

2. Coastal sagebrush: areas with such shrubs as California sagebrush, coyote brush, and wild buckwheats covering more than 50 percent of the ground.

3. Grass: areas with grasses and associated herbaceous vegetation covering more than 50 percent of the ground except where the type qualifies as woodland-grass.

4. Marsh: areas with herbaceous vegetation characteristics of poorly drained areas.

Nonvegetation types

a. Barren: bare ground, rocky areas, river beds, mine dredgings and talus essentially devoid of vegetation.

b. Cultivated, urban and industrial: areas that are under cultivation or are used for residential or industrial purposes.

Site quality of commercial forest land

The relationship between the broad site quality classes - high, medium, and low - and site class and site index ratings of commercial forest land is shown in the following table and explained in the appended footnotes.

Broad rating	All types except Douglas-fir		Douglas-fir types	
	Site class 1/	Site index 2/	Site class 3/	Site index 4/
High	IA	200	I, II	200
				170
	I	175	III	140
Medium	II	150		
	III	125	IV	110
Low	IV	100		
	V	75	V	80

1/ According to D. Dunning in Station Research Note No. 28, December 1, 1942, "A Site Classification for the Mixed Conifer Selection Forests of the Sierra Nevada."

2/ The total height that the average dominant trees reach at 300 years of age.

3/ According to R. E. McArdle and W. H. Meyer in U.S. Department of Agriculture Technical Bulletin 201, October, 1930, "The Yield of Douglas-fir in the Pacific Northwest."

4/ The average total height that dominant Douglas-fir trees reach at 100 years of age.

Stand-size classes. The national pattern established for the Forest Survey requires the classification of commercial forest land into the following stand-size classes.

Saw-timber stands. Defined as stands having a minimum net volume per acre of 4,000 board feet, International 1/4-inch rule, in saw-timber trees (11.0 inches d.b.h. and larger for all species).

a. Old-growth saw-timber stands: saw-timber stands in which over 50 percent of the net board-foot volume is in old-growth saw-timber trees.

b. Young-growth saw-timber stands: saw-timber stands in which 50 percent or more of the net board-foot volume is in young-growth saw-timber trees.

Pole-timber stands. Defined as stands failing to meet the saw-timber stand specification, but at least 10 percent stocked with pole-timber and larger trees and with at least half the minimum stocking in pole-timber trees (5.0 to 10.9 inches d.b.h.).

Seedling and sapling stands. Defined as forest stands not qualifying as either saw-timber or pole-timber stands but having at least 10 percent stocking of trees and with at least half the minimum stocking in seedlings and saplings (0 to 4.9 inches d.b.h.).

Nonstocked areas. Defined as areas of forest land not qualifying as saw-timber, pole-timber, or seedling and sapling stands.

In order to present the California forest area data in terms of stand-size classes, mapped age classes have been grouped as follows:

Age class	Stand-size class
Old growth Old growth-young growth	Old growth saw timber
Young growth-old growth Large young growth	Young growth saw timber
Small young growth	Pole timber
Nonstocked	Nonstocked

The forest stands thus classified as saw timber by this grouping conform closely to the National Forest Survey definitions. Areas of seedlings and saplings are not shown separately because these areas occurred in such small and widely scattered units that separate classification was not practicable. Any seedling and sapling stands of 40 acres or more which did occur were included with other stand-size classes, chiefly pole timber and nonstocked.

Ownership classifications

Indian land. Indian tribal lands and trust allotments. Lands held in trust by the Federal Government but administered and managed for Indian tribal groups or allotted in trust to individual Indians.

Public domain. Public lands that have remained unappropriated and unreserved and are administered by the Bureau of Land Management.

Other Federal. All other lands owned by the Federal Government not classed as national forest, national park or monument, Indian land, or public domain.

State, county, and municipal. Lands in State, county, or municipal ownership other than tax-deeded and state forest.

Timber operating company. A corporation actively engaged in commercial logging and milling of timber as a major enterprise.

Timber holding company. A corporation holding timber land for future commercial timber operations. The timber may be held for the company's own future use or to sell to other operators.

Timber operating individual. A person whose major enterprise is commercial timber operations. This includes individuals logging timber, operating a large or small sawmill, or splitting timber commercially for sale.

Timber holding individual. A person holding timber land for future commercial timber operations. The timber may be held for his own future operations or to sell to other operators.

Range livestock farming company. A corporation engaged primarily in range livestock farming operations.

Range livestock farming individual. A person whose major enterprise is range livestock farming.

Other farmers. Persons or corporations that have farming as their major activity, but whose principal agricultural enterprise is not range livestock farming.

Recreational property owners. Persons or corporations holding land principally for recreational purposes.

Other classified owners. All other land owners whose classification is known but does not logically fit the classes listed above. Examples are owners of land held for residential purposes only, mining claims, and reservoir sites.

Unclassified. Land ownerships in urban, suburban, and industrial settlements that are too small to map and classify properly, and ownerships that for other reasons cannot be classified and placed in appropriate categories.

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FOREST SURVEY RELEASE No. 15

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U. S. DEPARTMENT
OF AGRICULTURE
FOREST SERVICE

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION

FOREST PRODUCTS USED IN MINES IN CALIFORNIA AND NEVADA, 1950

By

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The underground mines of California are estimated to have used 337,700 cubic feet of round timbers and hewn ties and timbers and 3.9 million board feet of lumber and sawn timbers for their operations in 1950. For Nevada, corresponding amounts are 95,500 cubic feet and 3.1 million board feet. These estimates are based on the reports of 33 percent of the underground mines in California and 35 percent of those in Nevada, accounting for 99 percent and 95 percent of the mineral production,1/ respectively.

Data on forest products used in mines were collected in 1951 by the Forest Service in connection with the survey of equipment, supplies and manpower for the National Production Authority. In California and Nevada, state and federal mine agencies cooperated by supplying lists of underground mines active in 1950. Information was obtained only from underground mines because surface mines use almost no timbers.

1/ Mineral production as used here includes the rough material removed for its own value. In the case of metal mines this is ore; with nonmetals it may be a type of rock such as limestone, or a nonmetallic mineral such as turquoise.

The California Forest and Range Experiment Station is maintained at Berkeley, California, in cooperation with the University of California

Timbers, both round and sawn, are used in mines for posts (vertical members) and caps and sills (horizontal members). Small pieces of wood are used for blocks and wedges which help to hold the larger members in place. Small diameter poles, split material, or rough lumber called "lagging" are placed behind the posts or above the caps, to prevent loose rock material from falling into the tunnel. Ties are used as a foundation for rails on which the mine cars run. Plywood is used for timber shaft guides, ventilation doors, and similar purposes.

There is considerable variation in timber use among underground mines. Some mines require little or no timbering because the type of rock being worked does not loosen appreciably during mining operations. Other mines may require a great deal of timbering. Much of the timbering is temporary shoring which is abandoned as the work progresses. However, most mines have some relatively permanent installations in which timbers must be replaced as they decay or are crushed. In this survey the most consistent difference in timber use was between the metal mines--producing copper, gold, tungsten, etc.,--and the nonmetal mines--producing fluorspar, limestone, turquoise, etc. This was particularly true in California, where the nonmetal mines reported no use of round or hewn ties or timbers, and used less lumber and plywood relative to their mineral production than the metal mines (table 1).

Although the metal mines in California produced only slightly more ore than those in Nevada,2/ they used almost four times as much round and hewn timber. This difference in use probably exists because California mines are closer to a source of timber supply. Use of lumber in the two states was more nearly comparable. Plywood use was reported by relatively few mines.

Nonmetal mines in California produced almost 15 times as much mineral as Nevada mines but reported no use of round or hewn timbers compared to an appreciable volume used in Nevada. This difference in timber use is due to the nature of the material mined. California underground nonmetal mines produced borate and limestone which required little timbering for mining. On the other hand, Nevada nonmetal mines produced chiefly fluorspar, gypsum, perlite, talc, and turquoise, which frequently occur in formations requiring timbers.

2/ Products of metal mines in the two states were as follows:
California--chrome, copper, gold, lead, mercury, pyrites, silver, tungsten and zinc.
Nevada --antimony, copper, gold, lead, manganese, mercury, silver, tungsten, and zinc.

Table 1.- Estimated consumption of forest products by underground mines, California and Nevada, 1950

CALIFORNIA

Type and size class of mine [1]	Producing mines [2]	Total mineral production	Round timbers	Hewn ties and timbers	Lumber and sawn timbers	Plywood 3/8" equivalent
	No.	Tons	Cu. ft.	Cu. ft.	M bd.ft.	M sq. ft.
Metal						
Large	9	636,442	246,097	48,390	1,810	7.0
Medium	17	73,073	18,746	7,936	441	0.0
Small	191	18,940	11,883	4,650	980	0.0
All metal	217	728,455	276,726	60,976	3,231	7.0
Nonmetal	4	963,796	0	0	675	2.3
All mines	221	1,692,251	276,726	60,976	3,906	9.3

NEVADA

Metal						
Large	7	548,952	58,460	2,667	1,803	2.0
Medium	15	41,074	2,672	9,853	943	0.0
Small	224	26,184	728	9,352	170	0.0
All metal	246	616,210	61,860	21,872	2,916	2.0
Nonmetal	11	65,829	11,776	0	203	0.0
All mines	257	682,039	73,636	21,872	3,119	2.0

1/ Size classes based on 1950 mineral production defined as follows:
Large - 10,000 tons and over
Medium - 1,000 - 9,999 tons
Small - 1 - 999 tons

2/ Two or more mines operated by one company were tallied as one mine if consolidated reports were received.

The California metal mines had the highest ratio of round and hewn timber used per ton of mineral produced--almost one-half of a cubic foot per ton, or a little over three times that of Nevada metal mines. On the other hand, the metal mines of the two states were fairly close in the ratio of lumber and sawn timber use--between four and five board feet per ton for each state. However, the ratios of forest products used per ton of mineral produced was considerably greater for the nonmetal mines of Nevada than for this type of mine in California. In fact, the nonmetal mines of California had the lowest forest-products-use ratios among all groups--both types in both states. The ratios were:

Type of mine and state	Round and hewn ties and timbers (Cu.ft. per ton)	Lumber and sawn timbers (Bd.ft. per ton)
Metal		
California	0.464	4.44
Nevada	0.136	4.73
Nonmetal		
California	0.000	0.70
Nevada	0.179	3.08

Ratios such as the foregoing do not necessarily apply to individual mines because of the great variation in timber use among mines. Yet they do provide a basis on which to estimate consumption of mine timbers for a large area, such as a major mineral-producing state. Also they are useful for comparisons between states, and between years for a given state. The ratios for 1950 may be somewhat above normal because several metal mines were just resuming operations and used large amounts of timber in comparison with their ore production.

The latest previous estimate of forest products used in underground mines in California and Nevada was made for the year 1935.3/ Earlier surveys were made for 1923 and 1905.4/ Comparison of data from these surveys with similar figures from the 1950 survey (Table 2) show that both ore production and timber use have declined in recent years. In California the ratio of timber used per ton of ore production was higher in 1950 than in 1935; this may be due to the heavy timber use by mines resuming or enlarging their operations in 1950. In Nevada, the round-timber-use ratio has fluctuated within a rather small range in the years covered by the four surveys, but the sawn-timber-use ratio is definitely less in 1950 than in previously surveyed years.

3/ "Timber Requirements for Mines of the United States." W. D. Brush. U. S. Forest Service, Washington, D. C. January 1938.

4/ "Mine Timber Used Underground - - - Forest Products: 1923." U. S. Bureau of Census in cooperation with U. S. Forest Service and U. S. Geological Survey. Govt. Printing Office, Washington, D.C. 1925.

Table 2.- Ore production and use of forest products, California and Nevada - 1950, 1935, 1923, 1905

CALIFORNIA

Item	Unit	Year 1950	1935	1923	1905
Metal ore production[1/]	M tons	728	2,497	1,561	2,943
Forest products used in metal mines					
Round timbers[2/]	M cu.ft.	338	526	715	3,947
Sawn products[3/]	M bd.ft.	3,231	3,790	6,398	10,845
Forest products used per ton of metal ore					
Round timbers	Cu.ft./ton	0.464	0.211	0.458	1.341
Sawn products	Bd.ft./ton	4.44	1.52	4.10	3.69

NEVADA

Metal ore production[1/]	M tons	616	870	1,855	432
Forest products used in metal mines					
Round timbers[2/]	M cu.ft.	84	169	229	82
Sawn products[3/]	M bd.ft.	2,916	8,703	14,688	3,603
Forest products used per ton of metal ore					
Round timbers	Cu.ft./ton	0.136	0.194	0.123	0.190
Sawn products	Bd.ft./ton	4.73	10.00	7.92	8.34

1/ Production from underground mines excluding old tailings. Data for 1935, 1923 and 1905 were estimated from U. S. Bureau of Mines data with the assistance of Mr. R. B. Maurer, Mineral Statistics Branch, San Francisco.

2/ Includes hewn ties and timbers.

3/ Lumber and sawn timbers.

Source of timber-use data:

1935: "Timber Requirements for Mines in the United States," Table 3, page 16.

1923 and 1905: "Mine Timber Used Underground," U. S. Department of Commerce, 1925, Table 10, page 11.

In California the proportion of sawn lumber to round timbers appears to be increasing, but the reverse seems to be true in Nevada. The ratios of board feet of lumber and sawn timbers to cubic feet of round and hewn timbers used in the metal mines of California and Nevada in the years specified are:

Year	California	Nevada
1950	9.6	34.8
1935	7.2	51.5
1923	8.9	64.1
1905	2.7	43.2

Few mine timbers were treated with preservative in 1950, as indicated below, perhaps because much timbering is used only a short time--shorter than the time required for decay. The reported treatment of mine timbers with preservative, in percent, follows:

Type of material	California	Nevada
Round timbers	0.4	0.6
Hewn ties and timbers	4.5	0.0
Lumber and sawn timbers	5.4	2.5

Supplementary Information

The quantity of mine timbers by species was not determined for this survey. Judging from discussions with mine operators, however, Douglas-fir seems most generally used in California because of its strength and availability. Ponderosa pine is used occasionally, though it is not preferred since it lacks the strength of Douglas-fir. Red fir and white fir are also used to some extent where available. Sugar pine is often used for wedges because it can be easily shaped. In Nevada, pinyon and juniper are frequently used because of their ready availability.

Most of the round and hewn timbers are derived within the state where they are used. Most of the sawn timber used in Nevada is shipped in from the adjoining states of California and Oregon. The greater part of the sawn timbers used in California are produced within that state, though some of the Douglas-fir comes from Oregon.

Survey Procedure

In making this survey, the Division of Forest Economics of the California Forest and Range Experiment Station canvassed California and the seven western counties of Nevada,2/ while the Regional Office of the Forest Service at Ogden, Utah, covered the remainder of Nevada. The California Station compiled the data for both states.

2/ Washoe, Storey, Ormsby, Lyon, Douglas, Mineral, and Esmeralda Counties.

A questionnaire was mailed to all underground mines in the two states which were believed to have been active in 1950. Replies were received from all of the large mines and from a large part of the medium and small mines (Table 3). The timber used by mines which did not reply was estimated on the assumption that their timber-use ratio was the same as that of similar reporting mines. Estimated ore production of the mines which did not reply was provided by the U. S. Bureau of Mines, Mineral Statistics Branch, in San Francisco.

Table 3.- Response to canvass of forest products used in mines, California and Nevada - 1950

Type and size of mine	Responding mines as percent of producing mines			
	Basis: NUMBER OF MINES		Basis: MINERAL PRODUCTION	
	California	Nevada	California	Nevada
	Percent			
Metal				
Large	100	100	100	100
Medium	76	60	82	80
Small	24	29	42	25
Total metal	31	33	97	95
Nonmetal	100	64	100	89
All mines	33	35	99	95

The accuracy of the data may be affected by three types of errors: compiling, reporting, and sampling. All compilations were checked, so that errors from this cause are negligible. There are probably some reporting errors; but since only a limited field check of these data was made, the extent of reporting error could not be determined. Bureau of Mines personnel checked some of the data, and a few apparent misinterpretations were corrected at their suggestion.

Sampling errors indicate the differences which may be expected between the estimates of total timber use, and the figures that would have been obtained had reports been received from every mine. Sampling errors for estimates of mine timber use in California and Nevada in 1950 were calculated as follows:

State	Round and hewn timbers and ties	Lumber and sawn timbers
	Percent	
California	2.0	12.7
Nevada	7.1	9.6

The estimates will differ from completely reported timber use (had all mines reported) by not more than the percentage shown in two chances out of three.

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